EUROPA

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- Discovered on January 8th, 1610
- One of the four Galilean moons
- 390.4 million miles from Earth
- Jupiter’s smallest moon (6th largest in the solar system)
- Pioneers 10 and 11 and Voyagers 1 and 2 did flybys in the 1970s.
In 1973, Pioneer 10 discovered Jupiter’s radiation was far less than anticipated which made a long-term mission to Jupiter possible.

The Galileo Spacecraft launched on October 18th, 1989

- Reached Jupiter on December 7th, 1995
- Found evidence of a liquid ocean underneath the surface of Europa
- Observed that the volcanic activity on Lo could be 100x greater than that on Earth
- Found the first magnetic field around a moon at Ganymede

NASA had Galileo break up in Jupiter’s atmosphere on September 21st, 2003.
SURFACE

- Covered in a layer of Ice
- Surface temperature at Equator never rises above -260F; Pole temperatures never rise above -370F
- High degree of reflectivity
- Covered in cracks
  - Believed to be the result of tidal forces of an ocean underneath its frozen surface
What is a plume?
- Merriam-Webster dictionary defines a plume as something resembling a feather (as in shape, appearance, or lightness).
- In our case, plumes refer to vents of water vapor being released into the atmosphere.
CASSINI

- Jupiter flyby 2001
- Surrounded by hot, excited gas
  - The gas comes from the volcanoes on the moon Lo
- Thinner atmosphere than previously thought
- Contributes 40% less oxygen to it’s environment
  - Less oxygen means regular plumes are unlikely
- Did not show any plume activity at the time of flyby
- In 2005, Cassini detected jets of water vapor and dust off the surface of Saturn’s moon, Enceladus.
In 2013, the Hubble Telescope observed water vapor above the solar region of Europa.  

- *The most likely cause would be water Plumes.*

Hypothesized that lineae (long cracks on the surface) were venting water vapor into the environment.

- Intensity of the plumes varies with the orbital position of the moon; active jets have only been seen when the moon is farthest from Jupiter.

- One explanation is that the lineae experience more stress as gravitational tidal forces push and pull on the moon and open vents at greater distances.

- This supports the prediction that Europa tidally flexes due to a subsurface ocean.
“By far the simplest explanation for this water vapor is that it erupted from plumes on the surface of Europa,” said lead author Lorenz Roth of Southwest Research Institute in San Antonio. "If those plumes are connected with the subsurface water ocean we are confident exists under Europa's crust, then this means that future investigations can directly investigate the chemical makeup of Europa's potentially habitable environment without drilling through layers of ice. And that is tremendously exciting."
EUROPA CLIPPER

- Mission: “The Europa Clipper mission will conduct a detailed reconnaissance of Jupiter's moon Europa to see whether the icy moon could harbor conditions suitable for life. The mission will carry a highly capable, radiation-tolerant spacecraft that will perform repeated close flybys of the icy moon from a long, looping orbit around Jupiter.”
- Will happen sometime in the 2020’s.
- NASA has chosen 9 instruments to use on this detailed expedition including: cameras and spectrometers, ice penetrating radars, magnetometers and several thermal instruments.
WORKS CITED


